

5.2

Evaluate and Graph Polynomial Functions

Goal • Evaluate and graph other polynomial functions.

Your Notes

VOCABULARY

Polynomial

Polynomial function

Synthetic substitution

End behavior

Example 1 *Identify polynomial functions*

Decide whether the function is a polynomial function. If so, write it in standard form and state its degree, type, and leading coefficient.

a. $f(x) = 3x^3 + 4x^{2.5} - 6x^2$ b. $f(x) = x^2 + 3.7x + 9x^4$

Solution

a. The function _____ a polynomial function because the term _____ has an exponent that is _____.

b. The function _____ a polynomial function written as _____ in its standard form. It has degree _____ (_____) and a leading coefficient of _____.

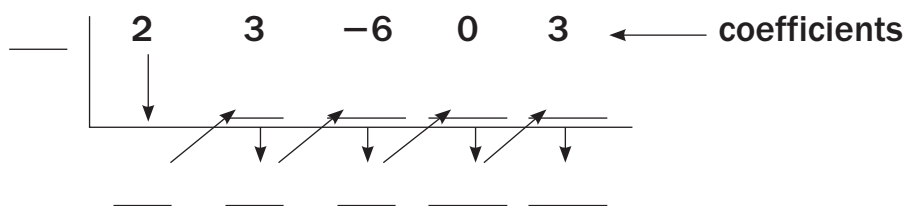
✓ **Checkpoint** State the degree, type, and leading coefficient of the function.

$$1. f(x) = -2x^3 + 2x^2 - 3x^4 + 5$$

Example 2 Evaluate by synthetic substitution

Use synthetic substitution to evaluate $f(x) = 2x^4 + 3x^3 - 6x^2 + 3$ when $x = 2$.

Write the coefficients of $f(x)$ in order of _____ exponents. Write the value of x to the left. Bring down the leading coefficient. Multiply the leading coefficient by _____ and write the product under the second coefficient. _____. Multiply the previous sum by _____ and write the product under the second coefficient. Add. Repeat for all of the remaining coefficients.



$$f(2) = \underline{\hspace{2cm}}$$

END BEHAVIOR OF POLYNOMIAL FUNCTIONS

For the graph of

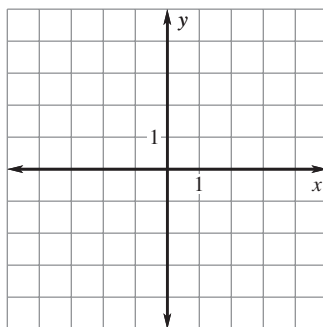
$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0:$$

- If $a_n > 0$ and n is odd, then $f(x) \rightarrow \underline{\hspace{2cm}}$ as $x \rightarrow -\infty$ and $f(x) \rightarrow \underline{\hspace{2cm}}$ as $x \rightarrow +\infty$.
- If $a_n < 0$ and n is odd, then $f(x) \rightarrow \underline{\hspace{2cm}}$ as $x \rightarrow -\infty$ and $f(x) \rightarrow \underline{\hspace{2cm}}$ as $x \rightarrow +\infty$.
- If $a_n > 0$ and n is even, then $f(x) \rightarrow \underline{\hspace{2cm}}$ as $x \rightarrow -\infty$ and $f(x) \rightarrow \underline{\hspace{2cm}}$ as $x \rightarrow +\infty$.
- If $a_n < 0$ and n is even, then $f(x) \rightarrow \underline{\hspace{2cm}}$ as $x \rightarrow -\infty$ and $f(x) \rightarrow \underline{\hspace{2cm}}$ as $x \rightarrow +\infty$.

Example 3 Graph polynomial functionsGraph $f(x) = -x^3 + 2x^2 + 2x - 1$.**Solution**

Make a table of values and plot the corresponding points. Connect the points with a smooth curve and check the end behavior.

x	-3	-2	-1	0	1	2	3
$f(x)$	_____	_____	_____	_____	_____	_____	_____

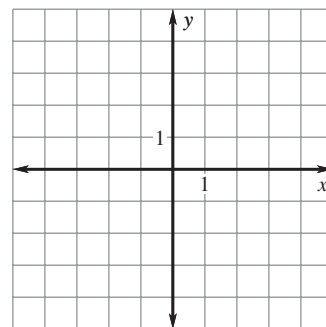


The degree is _____ and the leading coefficient is _____, so $f(x) \rightarrow$ _____ as $x \rightarrow -\infty$ and $f(x) \rightarrow$ _____ as $x \rightarrow +\infty$.

✓ **Checkpoint** Complete the following exercises using the function $f(x) = -x^4 + 3x^3 + x^2 - 4x - 1$.

2. Evaluate $f(x)$ for $x = -2$ using synthetic substitution.

3. Graph $f(x)$.

**Homework**